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(54) [Title of the Invention] DOUBLE-SIDED DISPLAYING
LIQUID CRYSTAL DISPLAY AND PORTABLE INFORMATION
TERMINAL DEVICE

(57) [Abstract]

[Object] To provide a double-sided displaying liquid crystal display and a portable information terminal device which solve defective form of display and the poor operability of input means in the conventional portable information terminal device and permit agreeable input operation.

[Solving Means] A first feature of the terminal device of the present invention lies in that an enclosure can be opened or closed with a supporting shaft A as a fulcrum and there are arranged right and left keyboard halves 7a and 7b which are divided into inner surfaces of a lid thereof and form a full keyboard together. The thus arranged keyboard

halves 7a and 7b which form a full keyboard together, are separated into the right and left ones. It is therefore possible to provide wide keys for tapping by the individual fingers, and accomplish input without a feeling of out of place with these keys.

[Claims]

[Claim 1] A double-sided displaying liquid crystal display comprising:

- a liquid crystal layer having a prescribed rotating polarization structure;

- a pair of transparent glass plates holding said liquid crystal layer in between and having transparent electrodes driving said liquid crystal layer;

- a pair of polarization plates arranged in lamination integral with said transparent glass plates;

- a first reflecting plate arranged at a portion displaying the back on one side of said polarization plates;

- a second reflecting plate arranged at a portion displaying the face on the other side of said polarization plates; and

- driving means which displays the back and the face in correct directions.

[Claim 2] The double-sided displaying liquid crystal display according to claim 1, wherein at least one of said

pair of transparent glass plates has a color filter formed to permit color display.

[Claim 3] The double-sided displaying liquid crystal display according to claim 1, wherein a first backlight and a second backlight permitting identification in a dark place in place of said first reflecting plate and said second reflecting plate.

[Claim 4] A portable information terminal device comprising:

two enclosures which can be opened or closed in a prescribed direction with a supporting shaft attached to a prescribed portion as a fulcrum; and

a keyboard arranged by dividing the same into both inner surfaces of said two enclosures and forms a full keyboard when the enclosures are opened.

[Claim 5] A portable information terminal device comprising:

two enclosures made possible to be opened or closed in a prescribed direction with a supporting shaft attached at a prescribed position as a fulcrum;

keyboard halves which are arranged separately on the both inner surfaces of said two enclosures and form a full keyboard when said enclosures are opened;

a double-sided displaying liquid crystal display which is arranged so that the back is displayed when said

enclosures are opened, and arranged so that the face is displayed when said enclosures are folded;

input means which permits input operation while watching information displayed on said double-sided displaying liquid crystal display in a state in which said enclosures are folded;

memory means which retains contents of information prepared by said keyboard and said input means; and

control means which controls said input means, said double-sided displaying liquid crystal display and said input means.

[Detailed Description of the Invention]

[0001]

[Technical field of the Invention] The present invention relates to a double-sided displaying liquid crystal display and a portable information terminal device using the same. More particularly, the invention relates to a double-sided displaying liquid crystal display which improves convenience of a user by providing a double-sided displaying liquid crystal display and a full keyboard in a compact and light-weight portable information terminal device such as a PDA, and a portable information terminal device.

[0002]

[Description of the Related Art] Electric notebooks are

conventionally popular as an information device for personal use, and a portable information terminal device called PDA (personal digital assistant) developed therefrom is also known. The PDA comprises an input and control keyboard and a touch panel, and has functions of schedule management and telephone directory function as well as message preparing function based on a keyboard and storing function thereof. There is available a type which permits, by mounting a modem function, communications such as facsimile (Fax) and electronic mail (e-mail) via a telephone line.

[0003] However, the keyboard provided in the conventional portable information terminal device is often based on an input system by common-use keys because of the limited space and is poor in operability. The conventional touch-panel input is generally accomplished by entering hand-written characters on the touch panel and causing the machine to recognize them. This method is however dependent on recognizing performance as to whether alphanumeric or Kanji characters. While having a leaning ability, a slow operation and a low recognition rate hinder popularization of the portable information terminal device.

[0004] On the other hand, there is available a method of building a full keyboard in the portable information terminal device. However, it is necessary to arrange key tops forcedly in a narrow space. The result is that each

button is very small in size, with a tight key pitch, leading to a very difficult operation. Such a full keyboard may usually be of an ordinary push-button type or the so-called touch panel type in which input is performed by means of a touch panel formed on the liquid crystal display panel.

In any of these cases, the key pitch becomes narrower according as the size is more compact, making it impossible unless the pin tip presses the key and leading to a poorer operability far from an agreeable blind touch.

[0005]

[Problems to be Solved by the Invention] The present invention was developed from such a point of view, and has an object to provide a double-sided displaying liquid crystal display and a portable information terminal device which eliminate the defective display form and poor operability of input operation in the conventional portable information terminal device, and ensure agreeable input operation.

[0006]

[Means for Solving the Problems] To solve these problems, the double-sided displaying liquid crystal display recited in claim 1 comprises a liquid crystal layer having a prescribed rotating polarization structure; a pair of transparent glass plates holding the liquid crystal layer in between and having transparent electrodes driving the liquid

crystal layer; a pair of polarization plates arranged in lamination integral with the transparent glass plates; a first reflecting plate arranged at a portion displaying, when conducting double-sided displaying on the liquid crystal panel, the back on one side of the polarization plates; a second reflecting plate arranged at a portion displaying, when conducting double-sided displaying on the liquid crystal panel, the face on the other side of the polarization plates; and driving means which displays, when conducting double-sided displaying on the liquid crystal panel, the back and the face in correct directions. As a result, it is possible to use a single liquid crystal panel on the face and the back, and reduce the display space, volume, weight and thickness.

[0007] The portable information terminal device recited in claim 4 comprises two enclosures which can be opened or closed in a prescribed direction with a supporting shaft attached to a prescribed portion as a fulcrum; and a keyboard arranged by dividing the same into both inner surfaces of the two enclosures and forms a full keyboard when the enclosures are opened. This permits opening the information terminal into two so as to enable key tapping with two hands. A half of the divided surface requires only a half the space for arranging a full keyboard. It is therefore possible to provide a wider key pitch, thus

improving key input operability.

[0008] The portable information terminal device recited in claim 5 comprises two enclosures made possible to be opened or closed in a prescribed direction with a supporting shaft attached at a prescribed position as a fulcrum; keyboard halves which are arranged separately on the both inner surfaces of the two enclosures and form a full keyboard when the enclosures are opened; a double-sided displaying liquid crystal display which is arranged so that the back is displayed when the enclosure are opened, and arranged so that the face is displayed when the enclosures are folded; input means which permits input operation while watching information displayed on the double-sided displaying liquid crystal display in a state in which the enclosures are folded; memory means which retains contents of information prepared by the keyboard and the input means; and control means which controls these components. As a result, it is possible to tap the keyboard to carry out input operation by two hands while watching the information displayed on the double-sided displaying liquid crystal display in a state in which the information terminal is opened into two. In a state in which the information terminal is closed, it is possible to conduct input operation by operating the input means while watching the information displayed on the surface of the double-sided displaying liquid crystal

display, thereby improving convenience for the user.

[0009]

[Embodiments] Concrete embodiments of the present invention will now be described with reference to the attached drawings.

[0010] A schematic configuration of the portable information terminal device of the present invention will first be described with reference to Fig. 1. Fig. 1 illustrates four side views of the portable information terminal device of the present invention in the closed state, representing a typical application display while reading in a new message of e-mail.

[0011] This terminal device 1 comprises a double-sided displaying liquid crystal display 2 having a structure to which a touch panel is integrally connected; an infrared data communication interface (represented by "IrDAi/f" in Fig. 1) 3 permitting cordless digital access; a jog dial (4, PCMCIA (Personal Computer Memory Card International Association permitting e-mail) slot 5; and an input pen 6 for operating the touch panel. The terminal device 1 of the present invention shown here is an example of design, and the shape and arrangement as a whole may be of any other design.

[0012] Operating steps of the portable information terminal device of the present invention will sequentially be

described with reference to Figs. 1 to 4.

[0013] In Fig. 1, for example, a cell phone (not shown) is connected to the PCMCIA slot 5 of the terminal device 1, and an e-mail as shown in the double-sided displaying liquid crystal display 2 is received. When transmitting a response to the e-mail received by using the portable information terminal device of the present invention, or when writing in a new message, a pull-down menu is displayed on the double-sided displaying liquid crystal display 2 by operating the input pen 6.

[0014] Fig. 2 illustrates a typical example of application display during writing of a new message of e-mail on the double-sided displaying liquid crystal display of the present invention. From the pull-down menu as shown in Fig. 2, each item is clicked by means of the input pen 6 or the jog dial 4. The terminal device 1 is opened, for example, to the right and the left while confirming the displayed contents.

[0015] Fig. 3 is a front view illustrating a state in which the terminal device 1 of the present invention is opened to the right and the left. The terminal device 1 of the present invention has a first feature that the enclosures can be opened or closed with a supporting shaft A as a fulcrum. Keyboard halves 7a and 7b formed by opening the enclosures to divide the same into two inner surfaces and

forming a full keyboard by closing the same. The keyboard halves 7a and 7b which form a full keyboard, are arranged to the right and the left. Keys to be tapped by the individual fingers can therefore be arranged at larger intervals, and input can be accomplished by key input without a feeling of out of place.

[0016] In this input mode, a display can be made on the surface of the double-sided displaying liquid crystal display 2 and also on the back thereof, in response to "new message", "response", "transfer", and "retransmission" of e-mail. In this embodiment, however, the surface is exclusively for display, prohibiting input. Naturally, the keyed-in contents are displayed on the surface and the back for every input.

[0017] A double-sided displaying liquid crystal display (back) 2b forming a second feature of the present invention is arranged to the right side of the terminal device 1 of the present invention in Fig. 3, i.e., at the right top forming the back of the double-sided displaying liquid crystal display 2 shown in Fig. 1, to permit displaying of the contents keyed in as described above.

[0018] Fig. 4 illustrates a typical display showing the entire image at the time of writing a new message of e-mail as displayed on the double-sided displaying liquid crystal display (back) 2b. The hatched portion represents the state

in which the scrolled portion is observed. That is, while the entire image B is displayed on the double-sided displaying liquid crystal display (face) 2a, a partial image C thereof is displayed on the double-sided displaying liquid crystal display (back) 2b as shown in Figs. 3 and 4. Any portion can be displayed by scrolling up or down as this partial image C by operating the jog dial 4.

[0019] More specifically, the cursor 8 (see Fig. 4) can be right-shifted by pressing the jog dial 4 to the terminal device 1 side, and the cursor 8 can be moved up or down by turning the jog dial 4. It is needless to mention that the display on the double-sided displaying liquid crystal displays (face) 2a and (back) 2b are always driven so as to be displayed correctly as viewed from the user.

[0020] The details of the double-sided displaying liquid crystal display of the present invention will now be described with reference to Figs. 5 and 6. Fig. 5 is a sectional view illustrating a basic structure of the double-sided displaying liquid crystal display of the present invention; and Fig. 6 illustrates typical examples of display of the double-sided displaying liquid crystal display of the present invention: (a) illustrates an example of display on the back; and (b) illustrates an example of display on the face.

[0021] The double-sided displaying liquid crystal display

of the present invention as shown in Fig. 5 roughly comprises a common glass 10 and a segment glass 11. A transparent electrode 12 is formed on the common glass 10. An intermediate film 14 such as a color filter 13 (in the case of a color liquid crystal display element) or a black matrix and a transparent electrode 15 are formed on the segment glass 11.

[0022] The two glass substrates are arranged oppositely to each other at a prescribed distance therebetween, and hold a spacer (not shown) in between, connected by a sealing material 16. More specifically, the cell gap of the liquid crystal display elements is held by the spacer, a liquid crystal pouring hole is formed, and the surroundings are bonded with the sealing material. The liquid crystal 17 is poured through the pouring hole not shown to form a liquid crystal layer, and two polarization plates 18 and 19 are integrally laminated on both surfaces of these glass substrates. A reflecting plate 20 is attached onto a polarization plate 18 at a portion (top in Fig. 5) corresponding to the back display of the common glass 10, and a reflecting plate 21 is attached onto a polarization plate 19 at a portion (bottom in Fig. 5) corresponding to the face display of the segment glass 11. A driver is connected to a liquid crystal cell thus completed, and the double-sided displaying liquid crystal display having the

above-mentioned configuration is completed. The driver may be provided within the liquid crystal cell.

[0023] The double-sided displaying liquid crystal display can be made identifiable in a dark place by arranging an EL (Electro Luminescent) or a guide plate type thin backlight in place of the reflecting plates 20 and 21.

[0024] A liquid crystal element having such a structure is called a reflecting STN-type element. The liquid crystal element covered by the present invention is not limited to this structure, but a DSTN of the double-panel structure, an FSTN using a film, and a TFT active matrix type using a thin-film transistor may be used, and any combination is applicable so far as the structure permits watching from face and back.

[0025] This embodiment presents a type having a color display on the face and a monochromatic display on the back.

The configuration may of course comprise a double-sided color display or a double-sided monochromatic display. When watching a color display from back, however, the chroma and brightness may be lower than in watching from face. When the drivers for face and back are not separated, it is necessary, as to the back display area, to flexibly use a Kana-Kanji-Alphanumeric character generators so as to give a mirror-surface display.

[0026] A typical operation of a liquid crystal display

element having such a configuration will be briefly described. An alignment layer (not shown) formed on the above-mentioned common glass 10 or the segment glass 11 is subjected to a rubbing treatment by a prescribed means, and the liquid crystal 17 is oriented through twisting by about 270° under the rubbing effect. The liquid crystal 17 has a rotary polarization property, and the polarizing surface rotates along the polarization plates 18 and 19. Information display is made possible by this rotary polarization property.

[0027] Fig. 6(a) illustrates a typical back display in the double-sided displaying liquid crystal of the present invention. Originally, a dot matrix is driven by preparing an appropriate size from 640 (H) x 480 (V) dots of VGA (Video Graphics Array). To facilitate understanding, 16 x 16 dots are configured into a dot matrix as shown in Fig. 6(a). By driving corresponding vertical and horizontal pixels by a driver (decoder) 22 and the driver (clock) 23, corresponding dots are turned on, and Kanji characters are displayed by the Kana-Kanji character generator.

[0028] Similarly, Fig. 6(b) illustrates a typical face display on the double-sided displaying liquid crystal display of the present invention. In this example, 1/2 VGA, i.e., 640 (H) x 240 (V) dots are displayed, forming a double-sided displaying liquid crystal display with a touch

panel. It is therefore possible to draw hand-written characters and pictures, and use it as a facsimile machine. Depending upon the application used, it is applicable as an electronic note, and carry out internet or personal computer communications using a Fax/Modem card or a cellular phone adapter card by the application of the above-mentioned PCMCIA slot 5.

[0029] In the configuration of the present invention, the double-sided displaying liquid crystal display is assumed to have a color TFT on the face and a 16 x 16 dots monochromatic TFT of a simple single-character display. The face driver is separated into a portion for face and a portion for back. The transparent electrodes in this case are exclusively for face and back. Even if the liquid crystal drives are separately for face and back, there would be no particular difference in the surrounding interface control. Or, the configuration may comprise the same liquid crystal panel, and a combination of mirror-image character generators for the same liquid crystal drives so that only four to five lines on the back can be correctly read from the back.

[0030] The circuit configuration of the portable information terminal device of the present invention will now be described with reference to Fig. 7. Fig. 7 is a block circuit diagram partially illustrating the portable

information terminal device of the present invention. In Fig. 7, the configuration has almost no difference from a conventional note-type personal computer, with only addition of a jog dial. The description of the operation of the present invention here therefore covers only the features.

[0031] The circuit configuration of the portable information terminal device of the present invention comprises, centering around an engine and peripheral control 30 for image processing, an infrared data communication interface (IrDAi/f) 3, a jog dial 4, a serial bus 31, a parallel bus 32, an amplifier 33 and a speaker 34, as well as a CPU 35 governing control of the entire terminal device, a ROM 36 storing a control program and the like, a RAM 37, a PCMCIA control 38, an RTC (Real Time Clock) 39, a display driver driving the double-sided displaying liquid crystal display of the present invention and a liquid crystal panel 40, and key pads 41.

[0032] The circuit operation of important portions of the portable information terminal device of the present invention will now be described. The engine and peripheral control 30 performs control of image display signal processing to the liquid crystal panel and peripheral circuits (infrared data communication interface (IrDAi/f) 3, the jog dial 4, the serial bus 31, the parallel bus 32, and amplifier 33, the PCMCIA control 38, the RTC 39 and the

like), and interface control with the CPU 35. For example, it performs processing upon receipt of a control instruction of the jog dial 4, causes displacement of the display position of the double-sided displaying liquid crystal display, processes contents keyed in from the key pads 41 at every input, and displays the same on the display driver and liquid crystal panel 40. The CPU 35 controls various interruptions on the basis of a realtime OS, and executes various application programs in accordance with instructions written in the ROM 36.

[0033] With the portable information terminal device of the present invention, there are available the following concrete advantages. A first advantage is that the information terminal is opened into two halves, and keyboard halves are arranged on the two inner surfaces to permit key tapping with the two hands. For each of the two halves, a space half that for a full keyboard will suffice. It is therefore possible provide a wide key pitch, thus improving the key input operability. A second advantage is that an area four fifth the liquid crystal is usually used for face display, and the reflecting plates and the dot drivers are divided into two in response to the respective areas. When opening this information terminal into two, the remaining one fifth is used for displaying characters upon key input for the back. By using the two sides of a single liquid

crystal panel, it is possible to reduce the displaying space, volume, weight and thickness, thus permitting downsizing of the information terminal.

[0034] Preferred embodiments of the present invention have been described above in detail. The present invention is also applicable in the other various embodiments. For example, by providing two drivers for face and back without using reflecting plates, characters and the like can be displayed from face as well as from back on the same liquid crystal screen. In this case, the liquid crystal area of the face can be utilized to the maximum extent. The double-sided displaying liquid crystal display is widely applicable to FLC (ferroelectric liquid crystal) and all types of display device expected to be developed hereafter.

Furthermore, it is needless to mention that the present invention is applicable in various forms within a range not departing from the intent of the present invention.

[0035]

[Advantages] According to the portable information terminal device of the present invention, as described above, the terminal device comprises keyboard halves arranged on the both inner surfaces of the two enclosures and forming a full keyboard when the enclosures are opened, and the double-sided displaying liquid crystal display arranged so that a back is displayed when the enclosures are opened, and the

face is displayed when the enclosure are folded. It is therefore possible to conduct key tapping with two hands by opening the enclosures of the information terminal into two, thus improving the key input operability. A single liquid crystal panel can be used with the two sides. This facilitates configuration of necessary items upon input, and permits achievement of an agreeable input environment in the portable information terminal device.

[Brief Description of the Drawings]

[Fig. 1] Fig. 1 shows four side views in a state in which the portable information terminal device is closed, and illustrates a typical application display during reading of a new message of e-mail.

[Fig. 2] Fig. 2 illustrates a typical application display during writing of a new message of e-mail into the double-sided displaying liquid crystal display of the portable information terminal device of the present invention.

[Fig. 3] Fig. 3 is a front view illustrating a state in which the portable information terminal device of the present invention is opened to the right and the left.

[Fig. 4] Fig. 4 illustrates a typical example of display showing an entire image upon writing a new message of e-mail displayed on the back of the double-sided displaying liquid crystal display of the present invention; the hatched

portion represents a state in which the display is observed by scrolling.

[Fig. 5] Fig. 5 is a sectional view illustrating the basic structure of the double-sided displaying liquid crystal display of the present invention.

[Fig. 6] Fig. 6 illustrates typical examples of display on the double-sided displaying liquid crystal display of the present invention: (a) illustrates an example of display on the back, and (b) illustrates an example of display on the face.

[Fig. 7] Fig. 7 is a block circuit diagram partially illustrating the portable information terminal device of the present invention.

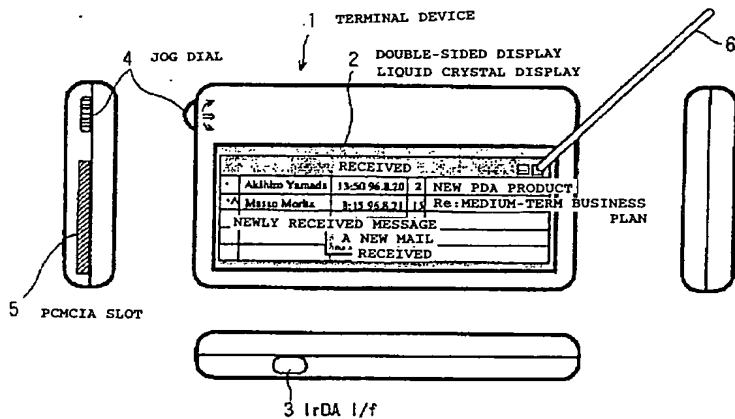
[Reference Numerals]

1: Terminal device, 2: Double-sided displaying liquid crystal display, 3: Infrared data communication interface, 4: Jog dial, 5: PCMCIA slot, 6: Input pen, 7a, 7b: Keyboard, 8: Cursor, 10: Common glass, 11: Segment glass, 12, 15: Transparent electrode, 13: Color filter, 14: Intermediate film, 16: Sealing material, 17: Liquid crystal, 18, 19: Polarization plate, 20, 21: Reflecting plate, 22: Driver (decoder), 23: Driver (clock), 30: Engine and peripheral control, 31: Serial bus, 32: Parallel bus, 33: Amplifier, 34: Speaker, 35: CPU, 36: ROM, 37: RAM, 38:

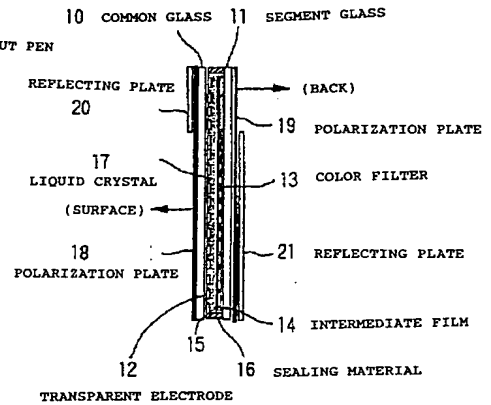
- 22 -

PCMCIA control, 39: RTC, 40: Display driver & liquid
crystal panel, 41: Key pad.

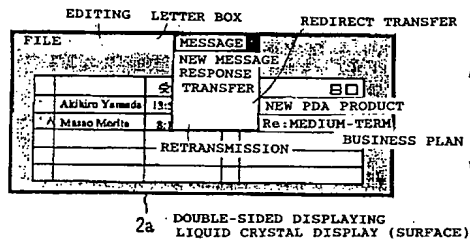
[FIG. 1]



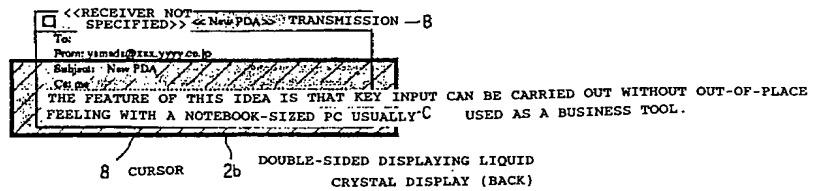
[FIG. 5]



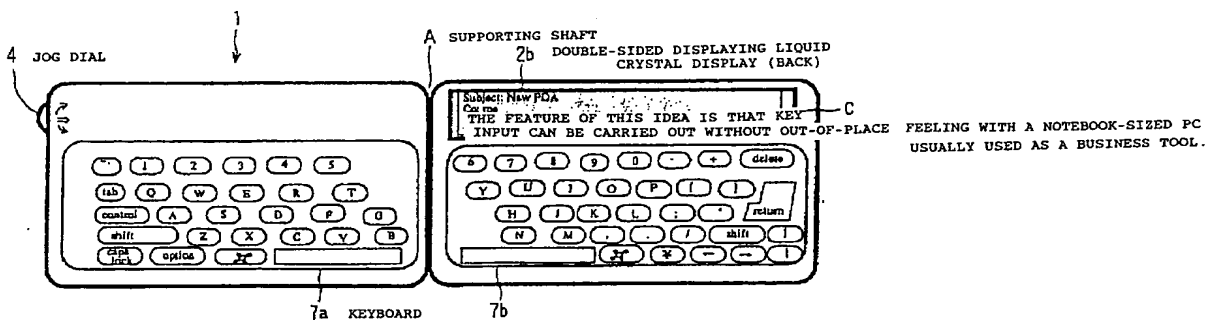
[FIG. 2]



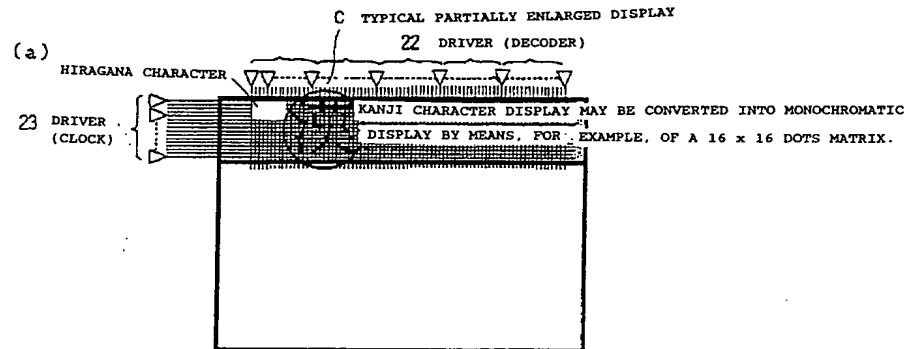
[FIG. 4]



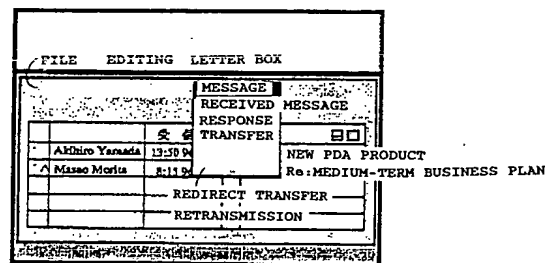
[FIG. 3]



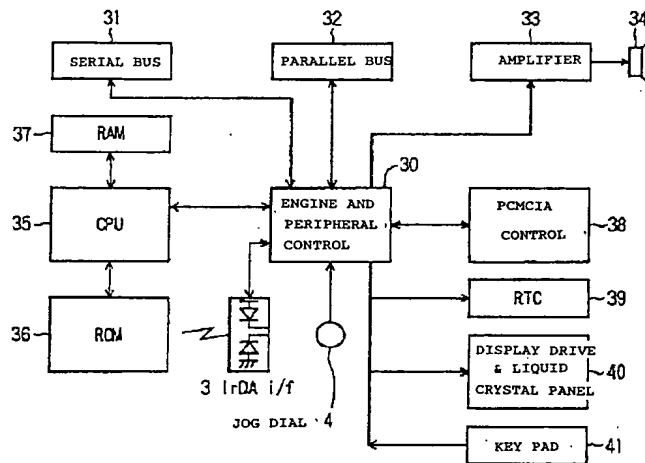
[FIG. 6]



(b)



[FIG. 7]





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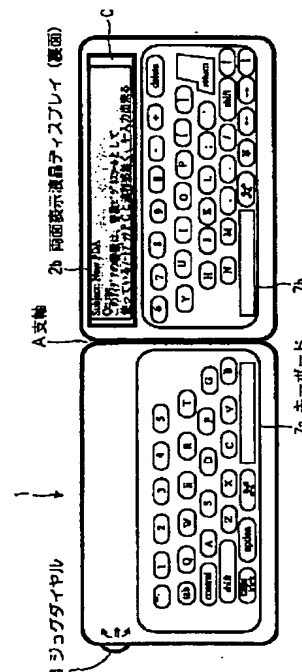
東京都品川区北品川6丁目7番35号ソニー株式会社内

(54) 【発明の名称】 両面表示液晶ディスプレイおよび携帯情報端末装置

(57) 【要約】

【課題】 従来の携帯情報端末装置の表示形態や入力手段の操作性の悪さを解消し、快適な入力操作を可能とする両面表示液晶ディスプレイおよび携帯情報端末装置を提供する。

【解決手段】 本発明の端末装置1は、第1の特徴事項として、筐体が支軸Aを支点として開閉できるようになっており、開蓋された両内面に分割、左右合わせてフルキーボードとなるキーボード7a、7bが配置されている。このように配置されたキーボード7a、7bは、フルキーボードでありながら、左右に分割してあるため、それぞれの指が打鍵するキー幅を広く配置することができ、キーインプットに違和感なく入力できる。



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き、表示スペース、体積、重量、厚みを削減することができる。

【0007】請求項4記載の携帯情報端末装置は、所定箇所に取り付けられた支軸を支点として所定方向に開閉自在となされた二つの筐体と、二つの筐体の両内面に分割して配設され、筐体が広げられたときフルキーボードとなるように成されたキーボードとを備えて構成した。これにより、情報端末を二つに開き、両手で打鍵できるようになる。また、分割して配設された片面は、フルキーボードを並べる半分のスペースで済むため、キーピッチが広く取れ、キー入力操作性を向上することができる。

【0008】請求項5記載の携帯情報端末装置は、所定箇所に取り付けられた支軸を支点として所定方向に開閉自在となされた二つの筐体と、二つの筐体の両内面に分割して配設され、筐体が広げられたときフルキーボードとなるキーボードと、筐体が広げられたとき裏面が表示されるように配設され、筐体が畳み込まれたとき表面が表示されるように配設された両面表示液晶ディスプレイと、更に、筐体が畳み込まれた状態において、両面表示液晶ディスプレイの表面に表示される情報を見ながら入力操作を可能とする入力手段と、キーボードおよび入力手段により作成された情報内容を保存する記憶手段と、これらを制御する制御手段とを備えて構成した。これにより、情報端末を二つに開いた状態では、両面表示液晶ディスプレイの裏面に表示される情報を見ながら両手でキーボードを打鍵して入力操作を行うことができる。また、情報端末を閉じた状態では、両面表示液晶ディスプレイの表面に表示される情報を見ながら入力手段を操作して入力操作を行うことができようになり、使用者の利便性を向上することができる。

【0009】

【発明の実施の形態】以下、本発明の具体的な実施の形態につき添付図面を参照して説明する。

【0010】先ず、図1を参照して本発明の携帯情報端末装置の概略構成を説明する。図1は本発明の携帯情報端末装置を閉じた状態の4側面図であり、電子メールの新規メッセージを読み込み中のアプリケーション表示例である。

【0011】この端末装置1には、タッチパネルが一体的に接合された構造の両面表示液晶ディスプレイ2、コードレスデジタルアクセスを可能とする赤外線データ通信インターフェース（図では、「IrDA i/f」と記す）3、ジョグダイヤル（4、電子メールを可能とするPCMCIA(Personal Computer Memory Card International Association)スロット5、およびタッチパネルを操作する入力ペン6を備えて構成される。なお、本発明の端末装置1はデザインの一例を描いたものであり、全体の形状や配置は他のデザインであっても良い。

【0012】次に、図1ないし図4を参照して本発明の

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携帯情報端末装置の動作を順次に説明する。

【0013】図1において、例えば携帯電話機（図示省略）を端末装置1のPCMCIAスロット5に接続し、両面表示液晶ディスプレイ2に示すような電子メールを受信する。本発明の携帯情報端末装置を用いて受信された電子メールに返事を出す、或いは新しいメッセージを書き込もうとする場合、入力ペン6を操作して両面表示液晶ディスプレイ2にプルダウンメニューを表示する。

【0014】図2は本発明の両面表示液晶ディスプレイに、電子メールの新規メッセージを書き込み中のアプリケーション表示例である。図2に示されるようなプルダウンメニューからそれぞれの項目を入力ペン6或いはジョグダイヤル4を用いてクリックする。そして、表示された内容を確認しつつ、端末装置1を例えば左右に開蓋する。

【0015】図3は本発明の端末装置1を左右に開いた状態を示す正面図であり、本発明の端末装置1は、第1の特徴事項として、筐体が支軸Aを支点として開閉できるようになっており、開蓋された両内面に分割、左右合わせてフルキーボードとなるキーボード7a、7bが配置されている。このように配置されたキーボード7a、7bは、フルキーボードでありながら、左右に分割してあるため、それぞれの指が打鍵するキー幅を広く配置することができ、キーインプットに違和感なく入力できる。

【0016】また、この入力モードは、電子メールの「新規メッセージ」、「返事」、「転送」、「再送」等に対応して、両面表示液晶ディスプレイ2の表面にも表示し、裏面にも表示することができる。但し、本例では表面は表示のみとし、入力は不可としている。当然ながら、キーインした内容がその都度、表面および裏面ともに表示される。

【0017】図3における本発明の端末装置1の右側、すなわち、図1の両面表示液晶ディスプレイ2の裏面に当たる右上部には、本発明の第2の特徴事項として、両面表示液晶ディスプレイ（裏面）2bが配置されており、前述のようにキーインした内容がその都度表示されるようになっている。

【0018】図4は両面表示液晶ディスプレイ（裏面）2bに表示される電子メールの新規メッセージ書き込み時の全体像を示す表示例であり、ハッチング部分がスクロールされて見えている状態図である。つまり、両面表示液晶ディスプレイ（表面）2aには、全体像Bとして表示されている訳であるが、図3および図4に示すような両面表示液晶ディスプレイ（裏面）2bには、その部分像Cが表示されることになる。この部分像Cは、ジョグダイヤル4を操作することにより、どの部分でもスクロールアップダウン表示することができる。

【0019】すなわち、ジョグダイヤル4を端末装置1側に押すことにより、カーソル8（図4参照）を右シフ

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【0031】本発明の携帯情報端末装置の回路構成は、画像処理用のエンジン&ペリフェラルコントロール30を中心に、赤外線データ通信インターフェース(IrDAi/f)3、ジョグダイヤル4、シリアルBus31、パラレルBus32、アンプ33およびスピーカ34の他、端末装置全体の制御を司るCPU35、制御プログラムなどが格納されたROM36、RAM37、PCMCIAコントロール38、RTC(Real Time Clock)39、本発明の両面表示液晶ディスプレイを駆動するディスプレイドライバ&液晶パネル40、およびキーパッド41を備えて構成されている。

【0032】本発明の携帯情報端末装置の要部の回路動作を説明するならば、エンジン&ペリフェラルコントロール30は、液晶パネルへの画像表示信号処理および周辺回路(赤外線データ通信インターフェース(IrDAi/f)3、ジョグダイヤル4、シリアルBus31、パラレルBus32、アンプ33、PCMCIAコントロール38、RTC39・他)の制御や、CPU35とのインターフェース制御を行う。例えば、ジョグダイヤル4の制御命令を受けて処理し、両面表示液晶ディスプレイの表示位置を移動させる動作や、キーパッド41により入力されたキーインした内容をその都度処理してディスプレイドライバ&液晶パネル40に表示する。CPU35は、リアルタイムOSに基づき、各種割り込みに対して制御したり、ROM36に書き込まれた命令に従って各種アプリケーションプログラムの実行を行う。

【0033】本発明の携帯情報端末装置では、次のような具体的な効果を上げることができる。すなわち、第1には、情報端末を二つに開き、その両内面に、両手で打鍵できるように略半分ずつキーボードを並べるようにしたため、その片面については、フルキーボードを並べる半分のスペースで済むため、キーピッチが広く取れてキー入力の操作性が向上する。第2には、通常時には、表面表示用の液晶として例えば全体の4/5の面積を用い、反射板とドットドライバをそれぞれの面積に応じて2分割する。そして、本情報端末を二つに開いた時には、残りの1/5を裏面のキーインプット時のキャラクター表示用として使う。つまり、一つの液晶パネルを表裏の両面で使うことにより、表示スペース、体積、重量、厚みを少なくでき、情報端末の小型化を図ることができる。

【0034】以上本発明の好適な実施の形態例につき詳細な説明を加えたが、本発明はこれら実施の形態例以外にも各種実施態様が可能である。例えば、本発明の応用例として、反射板を用いなくて、表面用と裏面用の二つのドライバを設けることにより、同じ液晶画面で、表裏から文字等を表示することができる。その場合は表面の液晶面積を最大限に活用することができる。また、両面表示液晶ディスプレイは、FLC(強誘電性液晶)や今後開発が予想されるあらゆるタイプのディスプレイデバ

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イスに広く適用することができる。更に、本発明の主旨を逸脱することなく種々の形態に応用発展できることは言うまでもない。

【0035】

【発明の効果】以上説明したように本発明の携帯情報端末装置によれば、二つの筐体の両内面に分割して配設され、筐体が広げられたときフルキーボードとなるキーボードと、筐体が広げられたとき裏面が表示され、筐体が畳み込まれたとき表面が表示されるように配設された両面表示液晶ディスプレイとを備えて構成するうよにしたため、情報端末の筐体を二つに開き、両手で打鍵できるように、キー入力の操作性を向上する。また、一つの液晶パネルを両面で使えるようにしたため、入力時の必要事項の確認が容易となり、携帯情報端末装置における快適な入力環境を実現することが可能となる。

【図面の簡単な説明】

【図1】 本発明の携帯情報端末装置を閉じた状態の4側面図であり、電子メールの新規メッセージを読み込み中のアプリケーション表示例である。

【図2】 本発明の携帯情報端末装置の両面表示液晶ディスプレイに、電子メールの新規メッセージを書き込み中のアプリケーション表示例である。

【図3】 本発明の携帯情報端末装置を左右に開いた状態を示す正面図である。

【図4】 本発明の両面表示液晶ディスプレイの裏面に表示される電子メールの新規メッセージ書き込み時の全体像を示す表示例であり、ハッチング部分がスクロールされて見えている状態図である。

【図5】 本発明の両面表示液晶ディスプレイの基本的な構造を示す断面図である。

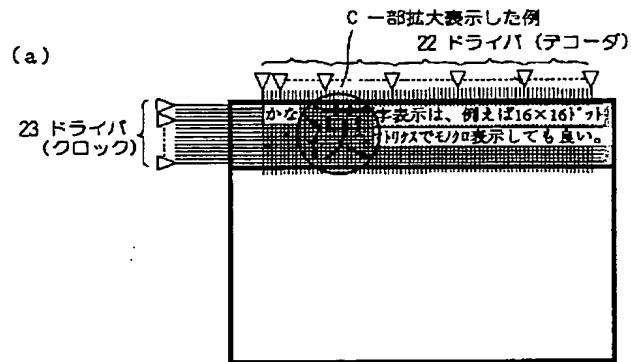
【図6】 本発明の両面表示液晶ディスプレイ表示例を示し、(a)はその裏面の表示例を示す図、(b)はその表面の表示例を示す図である。

【図7】 本発明の携帯情報端末装置の要部を示すブロック回路図である。

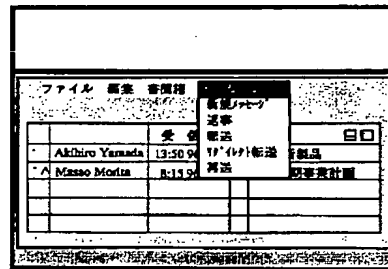
【符号の説明】

1…端末装置、2…両面表示液晶ディスプレイ、3…赤外線データ通信インターフェース、4…ジョグダイヤル、5…PCMCIAスロット、6…入力ペン、7a、7b…キーボード、8…カーソル、10…コモンガラス、11…セグメントガラス、12、15…透明電極、13…カラーフィルタ、14…中間膜、16…封止材、17…液晶、18、19…偏光板、20、21…反射板、22…ドライバ(デコーダ)、23…ドライバ(クロック)、30…エンジン&ペリフェラルコントロール、31…シリアルBus、32…パラレルBus、33…アンプ、34…スピーカ、35…CPU、36…ROM、37…RAM、38…PCMCIAコントロール、39…RTC、40…ディスプレイドライバ&液晶パネル、41…キーパッド

【図6】



(b)



【図7】

